

What is claimed is:

1. A method of wet processing electronic components having surfaces containing tantalum comprising contacting the surfaces of the electronic components with a processing fluid comprising a tantalum oxidizing solution and a fluorine ion producing agent maintained at an aqueous pH of 5 or lower.
2. The method of claim 1 wherein the contacting of the surfaces of the electronic components with the tantalum processing fluid removes contaminants from the surfaces of the electronic components.
3. The method of claim 1 wherein the contacting of the surfaces of the electronic components with the tantalum processing fluid etches the surfaces of the electronic components.
4. The method of claim 1 wherein the tantalum oxidizing solution comprises an oxidizing agent selected from the group consisting of hydrogen peroxide, ozone, chromic acid, nitric acid, iron cyanide and combinations thereof.
5. The method of claim 4 wherein the oxidizing agent is selected from the group consisting of hydrogen peroxide, ozone, and combinations thereof.
6. The method of claim 5 wherein the tantalum oxidizing solution comprises hydrogen peroxide and water, and the hydrogen peroxide is present in the tantalum oxidizing solution in an amount of at least about 0.1 volume percent based on the total volume of the tantalum oxidizing solution.
7. The method of claim 6 wherein the tantalum oxidizing solution comprises water, hydrogen peroxide, and ammonium hydroxide.

8. The method of claim 7 wherein the water, hydrogen peroxide and ammonium hydroxide are present in the tantalum oxidizing solution in a volume ratio of $H_2O:H_2O_2:NH_4OH$ of about 5:1:1 to about 200:1:1.

9. The method of claim 1 wherein the fluorine ion producing agent comprises hydrofluoric acid and deionized water in a volume ratio of $H_2O:HF$ of from about 5:1 to about 1000:1.

10. The method of claim 9 wherein the fluorine ion producing agent is maintained at a pH of about 3 or less.

11. The method of claim 10 wherein the fluorine ion producing agent further comprises hydrochloric acid.

12. The method of claim 11 wherein the fluorine ion producing agent comprises the deionized water, hydrofluoric acid, and hydrochloric acid in a volume ratio of $H_2O:HF:HCl$ of from about 50:1:1 to about 1000:1:1.

13. The method of claim 1 wherein the electronic components are rinsed with a rinsing liquid comprising deionized water after contacting the electronic components with the tantalum processing solution.

14. The method of claim 1 wherein the tantalum processing solution comprises a surfactant, anti-corrosion agent or combinations thereof.

15. A method of wet processing electronic components having surfaces containing tantalum comprising:

(a) placing one or more electronic components having surfaces containing tantalum in a single vessel;

(b) filling the vessel with a tantalum processing fluid comprising an oxidizing agent and a fluorine ion producing agent having a pH of 5 or lower; and

(c) contacting the electronic components with the tantalum processing fluid for a contact time sufficient to remove tantalum or tantalum nitride from the surfaces of the electronic components.

16. The method of claim 15 wherein the tantalum processing solution is removed from the vessel by direct displacement using another process fluid.

17. The method of claim 15 wherein the contacting of the surfaces of the electronic components with the tantalum processing fluid removes contaminants from the surfaces of the electronic components.

18. The method of claim 15 wherein the contacting of the surfaces of the electronic components with the tantalum processing fluid etches the surfaces of the electronic components.

19. The method of claim 15 wherein the tantalum oxidizing solution comprises an oxidizing agent selected from the group consisting of hydrogen peroxide, ozone, chromic acid, nitric acid, iron cyanide and combinations thereof.

20. The method of claim 19 wherein the oxidizing agent is selected from the group consisting of hydrogen peroxide, ozone, and combinations thereof.

21. The method of claim 20 wherein the tantalum oxidizing solution comprises hydrogen peroxide and water, and the hydrogen peroxide is present in the tantalum oxidizing solution in an amount of at least about 0.1 volume percent based on the total volume of the tantalum oxidizing solution.

22. The method of claim 21 wherein the tantalum oxidizing solution comprises water, hydrogen peroxide, and ammonium hydroxide.

23. The method of claim 22 wherein the water, hydrogen peroxide and ammonium hydroxide are present in the tantalum oxidizing solution in a volume ratio of $\text{H}_2\text{O}:\text{H}_2\text{O}_2:\text{NH}_4\text{OH}$ of about 5:1:1 to about 200:1:1.

24. The method of claim 15 wherein the fluorine ion producing agent comprises hydrofluoric acid and deionized water in a volume ratio of $\text{H}_2\text{O}:\text{HF}$ of from about 5:1 to about 1000:1.

25. The method of claim 24 wherein the fluorine ion producing agent is maintained at a pH of about 3 or less.

26. The method of claim 25 wherein the fluorine ion producing agent further comprises hydrochloric acid.

27. The method of claim 26 wherein the fluorine ion producing agent comprises the deionized water, hydrofluoric acid, and hydrochloric acid in a volume ratio of $\text{H}_2\text{O}:\text{HF}:\text{HCl}$ of from about 50:1:1 to about 1000:1:1.

28. The method of claim 15 wherein the electronic components are rinsed with a rinsing liquid comprising deionized water after contacting the electronic components with the tantalum processing solution.